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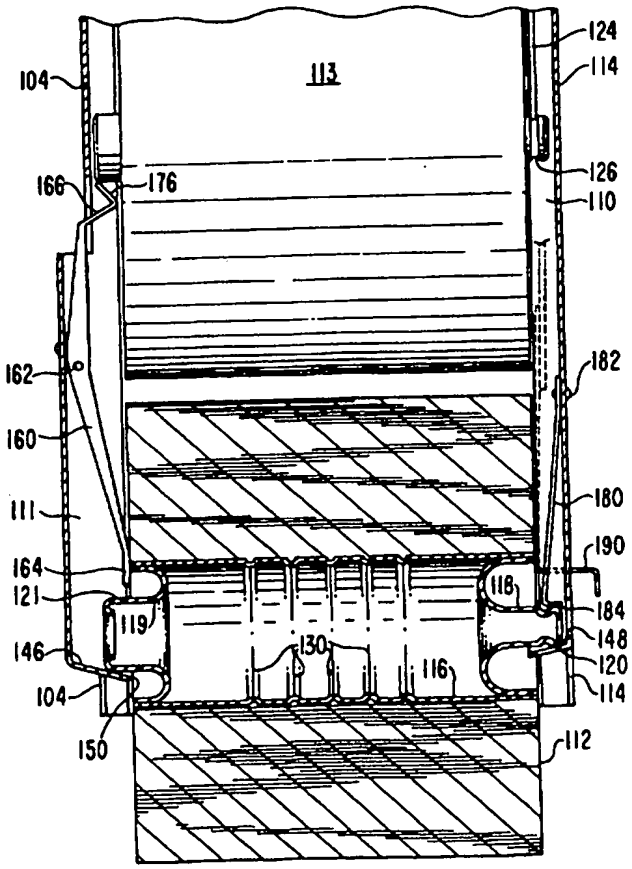
(54) Title: DISPENSING SYSTEM WITH KEYED GUIDE SLOT FOR SHEET ROLLS

(57) Abstract

A dispenser (100), a flexible sheet material roll (12), and a dispensing system for dispensing flexible meterial from the sheet material rolls. The system includes a rolled products dispenser and sheet material rolls. The dispenser includes opposing lateral side wall surfaces (104, 114), and a guide track (110, 111) located in each of the lateral side wall surfaces. At least one of the two guide tracks includes an elongated guide projection (124). Each sheet material roll includes flexible sheet material wound around a hollow center core having first and second ends, and first (118) and second (119) end caps positioned in respective ends of the hollow center core (116). Both end caps have an inwardly projecting portion located side the hollow centre core, and an outwardly projecting cylindrical spindle (120, 121) extending outwardly past their respective end of the hollow center core. The spindles guide the roll within the guide tracks of the dispenser. The spindle of one of the end caps includes at least one annular groove (126) in its circumference which interfaces with the elongated guide projection of the guide track, to provide a system where the roll is keyed to fit the dispenser. This assures proper orientation of the rolls in the dispenser, and provides an arrangement for coordinating the quality of the rolls being dispensed from specific dispensers.



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DISPENSING SYSTEM WITH KEYED GUIDE SLOT FOR SHEET ROLLS

FIELD OF THE INVENTION

The present invention relates to a dispensing system including a dispenser for dispensing sheet material from rolls, and a flexible sheet material roll with a keyed guiding system. More specifically, the present invention relates to a dispensing system, a dispenser, and flexible sheet material rolls, e.g., toilet tissue rolls, which assures proper orientation of the rolls in the dispenser, and provides an arrangement for coordinating the quality of the rolls being dispensed from specific dispensers.

BACKGROUND OF THE INVENTION

The present invention relates to flexible sheet material rolls, e.g., toilet tissue rolls, and the storage and dispensing of the rolled flexible sheet material. Institutional toilet tissue dispensers are frequently sized and adapted to hold and dispense multiple rolls of toilet tissue. Conventional dispensers of this type are typically designed so that rolls of toilet paper can be arranged inside the dispenser casing, whereby at least one roll is kept in an upper reserve position, while a lower roll is in a dispensing position. The tissue rolls have a hollow core with end caps located in both ends of the hollow core. The end caps include outwardly extending cylindrical projections which extend past the ends of the rolls. The dispenser includes spaced apart guide tracks in opposing lateral wall surfaces. The guide tracks each guide a projection from a respective end cap as the roll rotates about its center axis while it is being dispensed, and as the roll travels from the upper reserve position to the lower dispensing position when the lower roll is depleted and/or removed.

A general problem associated with these dispensers is that custodians or other operators insert new toilet tissue rolls into the dispenser in the incorrect orientation, i.e., reversed 180°. This makes dispensing the roll more difficult and/or impossible because the leading edge of the sheet material does not extend from the front of the dispenser.

In an attempt to overcome this problem, prior art dispensers have used guide tracks

of differing widths, and rolls having end caps with projections of differing diameters, which generally correspond to the differing guide track widths. Thus, the dispenser would include a narrow guide track, i.e., the right guide track, and a wide guide track, while the rolls would be provided with a smaller diameter projection, i.e., the right projection, and a larger diameter projection. Proper orientation of the roll into the dispenser by the custodian is enhanced as the larger or left end cap projection only fits easily into the larger or left guide track. However, there are at least two drawbacks associated with this present arrangement.

First, many custodians who may be in a rush, or who may be otherwise inattentive, may forcibly insert improperly oriented replacement toilet rolls into the guide tracks when loading the rolls into the dispenser. This may result in the jamming of the lower dispensing roll preventing it from being dispensed and/or the jamming of the upper reserve roll preventing it from falling down into the dispensing position. Further, this arrangement does not provide a system for coordinating the quality of the rolls for use with specific dispensers.

Additionally, color coding and written instructions may be written on a toilet tissue roll wrapper to help the custodian determine the proper roll orientation. However, custodians who are in a rush or are inattentive, can ignore these visual indicators as they are dependent on the lighting of the restroom area, or on the literacy of custodian to read instructions, which may also be in a different language.

SUMMARY OF THE INVENTION

The invention relates to a dispenser and end cap system for flexible material rolls, and a flexible sheet material roll, which assure proper orientation of the rolls in the dispenser, and provides an arrangement for coordinating the quality of the rolls being dispensed from specific dispensers.

In one embodiment, a dispenser is intended for use to dispense flexible sheet material from rolls having projecting end portions, one of which has an annular groove therein. The dispenser includes first and second opposing lateral side walls, with each lateral side wall having a corresponding guide track for guiding a respective projecting end portion of the sheet material roll. The guide track of the first lateral side wall includes an elongated guide projection therein being sized and shaped to correspondingly fit within the annular groove of the one projecting end portion.

The present invention is also directed to a dispenser system for dispensing flexible material from sheet material rolls. The system includes a rolled products dispenser and a sheet material roll. The dispenser includes first and second opposing lateral side walls, with each lateral side wall having a corresponding guide track. The guide track of the first lateral side wall includes an elongated guide projection therein. The sheet material roll includes flexible sheet material wound around a hollow core. The core has first and second ends, and roll guiding structure located partially within the hollow roll core and extending outwardly from both ends of the hollow roll core for guiding the roll of sheet material in the opposing guide tracks of the rolled product dispenser. The roll guiding structure includes a first outwardly projecting cylindrical portion extending outwardly past the first end of the hollow roll core and a second outwardly projecting cylindrical portion extending outwardly past the second end of the hollow roll core. The first outwardly projecting portion includes at least one annular groove located in its circumference. When the sheet material roll is inserted into the dispenser, the guide tracks guide a respective outwardly projecting cylindrical portion of the sheet material roll. The annular groove cooperates with the guide projection.

The present invention also provides a sheet material roll intended for use in a rolled product dispenser having opposing guide tracks and a guide projection in one of the guide tracks. The sheet material roll includes flexible sheet material wound around a hollow core having first and second ends and roll guiding structure. The roll guiding structure is located partially within the hollow roll core and extends outwardly from both the first and second ends of the hollow roll core for guiding the sheet material in the opposing guide tracks of the rolled product dispenser. The roll guiding means includes a first outwardly projecting cylindrical portion extending outwardly past the first end of the hollow roll core and a second outwardly projecting cylindrical portion extending outwardly past the second end of the hollow roll core. The first and second outwardly projecting portions permit the roll to be guided within the opposing guide tracks of the rolled products dispenser. The first outwardly projecting portion includes at least one annular groove located in its circumference cooperating with the guide projection.

The invention also relates to a sheet material roll which is intended for use in a rolled product having opposing guide tracks and a guide projection in one of the guide tracks of the dispenser. The sheet material roll includes a first end cap, a second end cap, and a roll of

flexible sheet material wound around a hollow center core having first and second ends. The first end cap is positioned in the first end of the hollow center core, and the second end cap is positioned in the second end of the hollow center core. Both end caps include an inwardly projecting portion located inside the hollow center core, and an outwardly projecting cylindrical portion extending outwardly past their respective end of the hollow center core. The outwardly projecting cylindrical portions permit the roll to be guided within opposing the guide tracks of the rolled products dispenser. The outwardly extending cylindrical portion of the first end cap includes at least one annular groove located within its circumference cooperating with the guide projection. A stop flange serves as an alignment device for aligning the annular groove with respect to the first end of the hollow roll core to align the groove with the elongated guide projection when the sheet material roll is inserted into a dispenser.

The present invention provides a dispenser, a sheet material roll, and a dispensing system which alleviates the above-discussed problems of prior art dispensers, rolls, and dispensing systems. The dispenser and spindles on the sheet material rolls are keyed which minimizes the possibility of improperly oriented rolls from being inserted into the dispenser. Further, the keyed arrangement provides a system for coordinating the quality of the rolls dispensed from the dispensers.

Further preferred features and advantages of the present invention will appear from the following detailed description given by way of example of a preferred embodiment illustrated with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top-right isometric view of one end, e.g., the right end, of the dispenser and the toilet tissue roll of the present invention, showing the interface between the roll end cap and the dispenser guide track;

Figure 2 is a cross-sectional view of the roll of toilet tissue paper with end caps shown in Figure 1, taken through the center of the roll, for use in the dispensing apparatus shown in Figure 1;

Figure 3 is an enlarged cross-sectional view of the keyed end cap of Figures 1 and 2 for use in the dispensing apparatus shown in Figure 1;

Figure 4 is a perspective view showing a dispenser housing with the conventional dispenser cover removed, incorporating the features illustrated in Figure 1 and correspondingly described hereinafter;

Figure 5 is a sectional view of the dispenser shown in Figure 4 showing a roll entering the upper end of the housing with the parts at the dispensing position in readiness to receive the roll;

Figure 6 is a sectional view of the dispenser shown in Figure 4 showing a roll in section in the dispensing position and a reserve roll retained in the reserve roll position, the rolls incorporating the features illustrated in Figures 1-3 and correspondingly described hereinafter;

Figure 7 is a sectional view of the dispenser shown in Figure 4, similar to Figure 6, showing an empty hollow roll core in the dispensing position indicating the forces operating to effect physically deformed removal of the hollow core;

Figure 8 is a sectional view of the dispenser shown in Figure 4 showing a full roll, having the features illustrated in Figures 1-3 and correspondingly described hereinafter, in the dispensing position;

Figure 9 is a sectional view showing a modified form of readily deformable hollow core from that illustrated in Figure 7, and incorporating the features illustrated in Figures 1-3 and correspondingly described hereinafter; and

Figure 10 is a sectional view showing another modified form of readily deformable hollow core from that illustrated in Figure 7, and incorporating the features illustrated in Figures 1-3 and correspondingly described hereinafter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figures 1-3 show the dispenser and end cap system of the present invention. The dispenser and end cap system includes a pair of guide tracks in a roll dispenser 5, only the right guide track 10 is shown in Figure 1, which accepts one or more rolls 12 of flexible sheet material, e.g., tissue paper. Guide tracks 10 are preferably located within opposing lateral wall surfaces 14 of dispenser 5 and preferably include spaced front and rear wall surfaces 10a and 10b defining the width of guide track 10, and an inwardly facing lateral wall surface 10c defining the length of guide track 10. In a preferred dispenser design, for

example the dispenser shown in Figures 4-8, guide tracks are generally vertically oriented permitting dispenser to house a lower paper roll in a lower dispensing position for immediate dispensing, and an upper roll of paper in a reserve position, and enabling dispenser to transfer the roll from the upper reserve position to the lower dispensing position.

As depicted in Figures 1 and 2, each roll 12 has a hollow core 16 with end caps 18, 19 located therein. Each end cap 18 and 19 includes a cylindrically shaped outwardly projecting portion 20 and 21, i.e., a spindle, extending past their respective side end 22 and 23 of roll 12. Spindles 20 and 21 interface with, and are guided within, a respective guide track 10 in the dispenser. Further, depending upon the desired dispenser used, hollow core 16 may be designed to be readily deformable, or otherwise breakable to assist in its removal from the dispenser. To achieve such a characteristic, core 16 is preferably made of light weight paperboard such as shown in Figure 9, of a core construction as shown in section on Figure 6 wherein the core intermediate its ends is scored or otherwise weakened, or is made in the form of a split core. U.S. Patent No. 4,522,346 to Jespersen discloses the use of split cores, while U.S. Patent No. 4,671,466 to Jespersen et al. discloses the use of deformable scored or weakened cores. The '346 and '466 patent are both hereby incorporated by reference.

To facilitate the accurate orientation of roll 12 in the dispenser, opposing guide tracks preferably have different sized widths. Accordingly, end caps 18 and 19 of roll 12 also have spindles 20 and 21 with different sized diameters. For example, spindle 20 of end cap 18 has a smaller diameter than spindle 21 of end cap 19. Similarly, guide track 10 is narrower than its opposing guide slot, not shown in Figure 1. Guide slot 10 is also narrower than the diameter of spindle 21 such that spindle 21 cannot normally fit in guide slot 10. Paper roll 12 is delivered to the dispenser locale with the end caps placed in their proper core end. The custodian will usually insert roll 12 into the dispenser with the proper orientation, i.e., with narrow spindle 20 in narrow guide slot 10, as roll 12 will not fit into the dispenser oriented the opposite way, unless it is improperly forced.

To minimize the possibility of a custodian forcibly inserting an improperly oriented roll, and to achieve other advantages as described herein, at least one of the guide tracks and one of the spindles are "keyed". The keyed feature is partially provided by including a guide projection strip 24 on at least one the front and rear wall surfaces 10a and 10b of the guide

tracks, e.g., guide track 10, and partially provided by a U-shaped annular groove 26 located in the circumference of its corresponding spindle, e.g., spindle 20. In the preferred embodiment, projection strip 24 is located in narrow guide track 10, and annular groove 26 is located in narrow spindle 20. Guide projection strip 24 is similarly shaped, and sized slightly smaller than, annular groove 26, i.e., they are substantially complementary to each other, to provide an arrangement where spindle 20 cooperates with guide track 10. It is recognized that while groove 26 is preferably U-shaped, groove 26 could take the form of one of many other desirable shapes, e.g., V-shaped. Further, depending on the design of the dispenser and user preferences, guide strip 24 may extend from the top of guide track 10 to the bottom of guide track 10, or may be just long enough to prevent the insertion of a roll with a non-keyed end cap.

As shown in Figures 2 and 3, each end cap 18 and 19 includes a roll core insertion portion 28 and 29 for insertion into hollow core 16 of roll 12. Roll core insertion portions 28 and 29 of both end caps 18 and 19 are functionally identical, and thus, only insertion portion 28 is described herein. As best shown in Figure 3, roll core insertion portion 28 preferably includes an annular leading edge 30, a conical centering portion 32, and an annular outer wall 34. Leading edge 30 and centering portion 32 facilitate the insertion of end cap 18 into core 16 by providing an inherent centering structure, wherein spatial tolerances are absorbed by the conical centering portion 32 bearing against the inner surface of hollow roll core 16. Insertion of each end cap 18 and 19 into core 16 can continue until stop flange 36, which is located at the end of outer wall 34, abuts against end 22 of roll 12. Upon the complete insertion of portion 28, outer wall 34 fits snugly within the inner wall of hollow core 16. Stop flange 36 guarantees proper tolerances between the groove 26 and the roll 12, and therefore also provides the desired tolerances between the spindle 20 and guide slot 10, in particular the mating of groove 26 to projection 24. Stop flange 36 thus functions as an alignment device that assures the proper predetermined spacing of groove 26 from the edge of the roll so that it aligns with projection 24.

End cap 18 is preferably made from a plastic by any desirable forming technique. For example, end cap 18 may be injection molded, and groove 26 may be formed in the molding process or in a secondary operation by any technique including a forming jaw actuated by a hydraulic cylinder.

One advantage obtained by projection strip 24 is that it further restricts the width of guide track 10. This makes it more difficult for a custodian to insert an improperly oriented roll. Further, as a custodian would have increased difficulty inserting a roll with an "unkeyed" or an incorrectly keyed end cap, there is a higher probability that he will notice this difficulty and only install a roll in the proper orientation and with a correctly keyed end cap. Further, these keyed features, e.g., groove 26 and strip 24, help to inherently provide a visual indicator to reduce the possibility that a custodian will attempt to insert an improperly oriented roll. Groove 26 can be felt by the custodian, and therefore, also serves as a tactile indicator to minimize the possibility that the custodian will improperly insert a roll.

Another advantage achieved by the keyed features is that undesirable lateral motion of rolls 12 is inherently limited by the interfacing and guiding relationship between projection strip 24 and groove 26. As the lateral motion of roll 12 is limited by strip 24 guiding groove 26, more of the force applied to the roll in the dispensing process by pulling the free end of the sheet material will be converted to smooth rotational movement. Further, lateral alignment of the rolls 12 with respect to guide tracks 10 is achieved without the need to rely on the inwardly facing lateral wall surfaces 10c of the guide tracks 10 laterally restraining the ends of spindles 20 and 21.

Further, while Figures 2 and 3 depict only one projection strip 24 and groove 26 pair, more than one projection strip 24 and groove 26 pair could be used. Alternatively, or in addition to, varying the number of strip 24 and groove 26 pairs, the spacing of the strip 24 and groove 26 pairs with respect to the roll 12 can be varied. This provides additional roll and dispenser keying combinations and enhances the feature of requiring that only properly "keyed" rolls are inserted into the keyed dispensers.

This feature helps provide an arrangement for coordinating the quality of the rolls being dispensed from predetermined dispensers. For example, toilet tissue could be manufactured in accordance with two separate degrees of softness, e.g., grades A and B, with A being the softer grade. A company could manufacture and ship the rolls with the properly "coded" or "keyed" end cap projecting portions 20 corresponding to their grade. The dispensers would also be correspondingly "coded" or "keyed" by the number and/or spacing of projection strips 24, so that they only accept rolls 12 of a predetermined of

minimum softness level. Assume that it is desirous to have dispensers on a specific building floor only dispense paper from rolls having the top quality, i.e., grade A. Grade B paper would not fit in the dispenser because either the number or spacing of grooves 26 in end cap 18 would not match the keyed pattern of the strip or strips 24 in guide track 10. Similarly, this arrangement saves money by also assuring that a more expensive grade A paper is not used in a dispenser where it is determined that a grade B paper is sufficient.

In addition to an exclusive keyed arrangement, i.e., one-to-one matching only, the keyed arrangement can provide a system in which dispensers are designed only to permit rolls which have a minimum predetermined grade. For example, grade B paper could have an end cap with one groove, while grade A paper could include an end cap with two grooves. A dispenser for top quality paper would be designed with two guide projection strips 24, and would accept only rolls with an end cap keyed for grade A paper. A dispenser for a lesser quality paper, i.e., grade B or better, would include only one guide projection strip 24, and accept rolls with an end cap keyed for either grade A or grade B paper, as the additional groove in the grade A paper end cap would not affect the dispensing of the roll in the dispenser. Therefore, this keyed feature minimizes the insertion of improperly oriented rolls, and assures that specific dispensers dispense only a minimum grade of paper.

Further, the keyed features provide a system which prevents the insertion of counterfeit or undesired rolls into a keyed dispenser. For example, if the user of an unkeyed dispenser is satisfied with the quality of sheet material rolls from a specific manufacturer, and only wants rolls from that manufacturer dispensed from his dispenser, then the user would have to constantly supervise the purchasing and installation of the rolls by maintenance personnel to assure that the rolls originated from the desired manufacturer. However, if the dispenser is keyed to have one or more projection strips, the specific keying can be coordinated with the desired manufacturer to provide rolls with spindles specifically keyed to fit the dispenser design. Any attempt by maintenance personnel to install unauthorized rolls, i.e., improperly keyed rolls, from other manufacturers would be thwarted, as unauthorized rolls would be unable fit into the keyed dispenser.

The keyed feature of present invention also permits end caps having the same sized projections to be used on opposing ends of the roll, and still achieve proper orientation by keying one end cap differently. This may have manufacturing advantages as it permits both

end caps to be made from the same initial mold.

Additionally, it is recognized that a single inserted member having guide spindles extending from its opposing ends could be used in lieu of the two inserted end cap members. In such an arrangement, the outwardly extending spindles would preferably be shaped similar or identical to spindles 20 and 21 of end caps 19 and 20.

As previously described, the features as described in Figures 1-3 are preferably included in a dispenser design wherein the guide tracks are generally vertically oriented permitting the dispenser to house a lower paper roll in a lower dispensing position for immediate dispensing, and an upper roll of paper in a reserve position, and enabling the dispenser to transfer the roll from the upper position to the lower position. An example of such a dispenser without many of the features of Figures 1-3, e.g., the keyed features including the guide projection strip and the groove, is described in U.S. Patent No. 4,671,466 to Jespersen et. al., which is hereby incorporated by reference.

Figures 4-9 illustrate a dispenser and end cap system for rolls of wound flexible web material incorporating features of the present invention as illustrated in Figures 1-3 and as described, supra. In describing dispenser 100 as shown in the drawings, and particularly in Figure 4, it should be pointed out that to facilitate illustrating structural features of this embodiment, the dispenser cover that would conventionally be provided has not been shown on the drawings. Reference may be made to U.S. Pat. No. 3,437,388 to Jespersen, which is hereby incorporated by reference, for an exemplification of how a conventional cover completing the dispenser cabinet may be pivotally mounted in relation to the housing 102 forming the chassis for the working components of the dispenser.

Referring to Figure 4 in describing the dispenser 100, the housing 102 provides a first side wall 104, a second side wall 114 and a back wall 108. It will be understood that in use of dispenser 100, the housing 102 forming the chassis for the working components of the dispenser will be mounted on a wall at the desired location for dispenser use. Thus, the back wall 108 of housing 102 will be provided with appropriate openings, not shown, to accommodate the fasteners employed in affixing dispenser 100 to the desired wall location.

As has been mentioned above, the conventional cover which along with housing 102 completes the dispenser cabinet is not shown. Side walls 104 and 114 are provided with aligned holes 109 which serve as pivot points to mount the dispenser cover.

Side wall 104 of housing 102 is provided with an inwardly facing channel or guide track 111. Likewise, the opposite side wall 114 is provided with an inwardly facing channel or guide track 110. This pair of inwardly facing, opposing guide tracks 110 and 111 serves to guidingly receive the spindles which form part of the roll core and serve as the roll core supports where they project from the opposite ends of the rolls when the rolls are loaded into dispenser 100.

Preferably the channels 111 and 110 are of different widths to accommodate different diameter spindles forming the roll core supports for the rolls that are loaded into dispenser 100. These different width channels mate with different diameter roll core support spindles to insure the proper unwinding direction and roll orientation in loading the rolls into dispenser 100. Each of the guide track channels 111 and 110 in the side walls 104 and 114 of housing 102 is provided at its lower end with a saddle member, this member being numbered 146 at the bottom of channel 111, and 148 at the lower end of channel 110. The bottom of housing 102 is open at 150 such that the roll 112 retained in the roll dispensing position at the bottom of dispenser 100 projects downwardly through open bottom 150 as shown on Figures 6 and 8 for the web material on roll 112 to be accessible from dispenser 100 by the intended user.

Referring to Figure 6, the make up of roll 112 may be described as exemplifying the type of rolls of flexible web material contemplated for dispensing in the dispenser 100 of this invention. Thus, roll 112 has the flexible web material wound on a tubular hollow roll core 116. In the form of roll core illustrated on Figures 6 and 7, the core 116 is rendered readily deformable by having a series of spaced circumferential score lines 130 formed intermediate the ends of the core. It will be understood that other weakening techniques may be employed to render the core readily deformable once the wound web material initially carried on the core has been exhausted.

Another form of readily deformable hollow core 116' is illustrated in Figure 9. Core 116' is formed from a light weight material such that the forces applied to the core as described hereinafter to enable easy removal of the hollow core are sufficient to physically deform the core without the necessity for weakening scores 130, such as shown in the readily deformable core in Figures 6 and 7. In Figure 10, core 116 is illustrated in the form of a split core 116" core. An exhausted core of this type is removed from the dispenser by the

splitting action of the core.

In the form of roll core illustrated, the roll core supports for either core 116, 116' or 116" are provided by an end cap 119 having a spindle 121 inserted in one outer end of the tubular hollow core and an end cap 118 having a spindle 120 inserted in the tubular hollow core at the opposite outer end. It will be seen from Figure 6 that the core support spindle 121 of end cap 119 engages in the saddle member 146 at the bottom of channel 111 and the core support spindle 120 of end cap 118 engages in the saddle member 148 at the bottom of channel 110, supporting roll 112 in the roll dispensing position within the housing 102 of dispenser 100. As so supported, the toilet paper material on roll 112 projects down through the open bottom 150 of housing 102.

To minimize the possibility of a custodian forcibly inserting an improperly oriented roll, and to provide other advantages including those as described supra, at least one of the guide tracks and one of the spindles are "keyed". The keyed feature is partially provided by including a guide projection strip 124 on at least one of the guide tracks, e.g., guide track 110, and partially provided by a U-shaped annular groove 126 located in the circumference of its corresponding spindle 120. Guide tracks 110 include spaced front and rear wall surfaces 110a and 110b, defining the width of guide tracks 110, and an inwardly facing lateral wall surface 110c. In the preferred embodiment, projection strip 124 is located in narrow guide track 110 along either the front or rear wall surface 110a or 110b, and annular groove 126 is located in narrow spindle 120. Guide projection strip 124 is similarly shaped, and sized slightly smaller than, annular groove 126, to provide a complementary arrangement where spindle 120 cooperates with guide track 110. It is recognized that while groove 126 is U-shaped, groove 126 could be one of many other desirable shapes, e.g., V-shaped. Further, guide strip 124 is illustrated as extending from the top of guide track 110 to a position adjacent a roll in the reserve or storage position. However, it is recognized that guide strip 124 may extend further downward along guide track 110, or may be of a length just sufficient to prevent the insertion of a roll with a spindle which is not properly keyed.

As illustrated on the drawings, the open bottom 150 is defined within the side walls 104 and 114, and back wall 108 of housing 102, these walls extending down beneath saddle members 146 and 148. Generally, with the dispenser cover in place, the cover in association with the housing 102 might take the configuration shown in the above discussed U.S. Patent

No. 3,437,388. With such a configuration the toilet paper material on roll 112 is exposed through the open bottom 150 of dispenser 100. It will be understood that the roll 113 partially shown on Figures 6 and 7 as it is retained in a reserve roll position within housing 102 would have a similar composition to the composition that is hereinabove described with reference to roll 112.

The operating control for the dispenser 100 as between the two rolls 112 and 113 loaded into the housing 102 is provided by a control lever 160. Lever 160 is pivotally mounted in channel 111 of side wall 104 on pivot pin 162. This pivotal mounting enables pin 162 to simply pass through the sides of channel 111 to effect the desired mounting of control lever 160.

Lever 160 has a lower sensing end 164 which serves to sense the presence of a roll core 116. As will be explained with reference to Figure 7, this lower end also applies an axial force F_L to the upper portion of the end of the hollow roll core 116. This sensing of a roll core such as that of roll 112 as shown on Figure 6 occurs when this first roll is retained at the roll dispensing position within housing 102. An upper support end 166 on pivotally mounted lever 160 serves to retain a second roll 113 in the reserve roll position within housing 102, such as roll 113 also shown on Figure 6.

A leaf spring 168, which may be riveted at 170 to the outer wall of channel 111, serves to bias control lever 160 toward the position as shown in Figure 5. The biasing force of spring 168 thus urges the sensing end 164 of lever 160 toward the roll dispensing position within housing 102. It consequently urges support end 166 of lever 160 away from the reserve roll position within housing 102, and applies the force F_L to the upper portion of one end of the hollow core 116.

The upper support end of control lever 160 is formed with a reverse bend in the embodiment shown such as to provide a surface 176 which is inwardly inclined relative to the plane of the first side wall 104 of housing 102. This inclined surface 176 physically engages the roll core support spindle 121 such as shown in Figures 6 and 7 with reference to roll 113 retained in the reserve roll position within housing 102 of dispenser 100.

As will be apparent from the showing on these figures, the inward inclination of surface 176 on the upper support end 166 of lever 160 tends to utilize the weight of roll 113 acting down on the spindle resting on inclined surface 176 in a manner tending to urge lever

160 and its upper support end 166 outwardly from blocking track 111. Thus, the weight of roll 113 promotes the action of the lower end 164 of lever 160 in pressing inwardly against the upper portion of the end of core 116 thereby providing an added biasing force against core 116 tending to buckle the readily deformable core upon exhaustion of web material.

The second side wall 114 of housing 102 is provided with a spring biased latch 180 which may be riveted at 182 to the outer wall of channel 110 for this latch 180 to lie within channel 110. The spring biased latch 180 has its lower end 184 spaced above saddle member 148 at the bottom of channel 110. Thus it is spaced sufficiently above such saddle member that the spindle 120 of end cap 118 on the hollow core 116 may freely rest on saddle member 148 beneath the end 184 of latch 180 as shown on Figures 6 and 7.

As the spindle 120 of end cap 118 moves down along the guide track channel 110, the spindle 120 will act to depress latch 180 until it moves beneath the latch end 184. In this position, reverse movement along the guide track 110 is blocked by latch 180. This blocking action serves to prevent the right end of roll 112, as seen in Figure 6, from being raised up within housing 102 of the dispenser thus preventing pilferage of full or partial toilet paper rolls from the dispenser 100. The left end of roll 112 is likewise prevented from being raised back up within channel 111 by the lower sensing end 164 of lever 160 overlying the spindle 121 on end cap 119.

The second side wall 114 of housing 102 is also provided with a biasing leaf spring 190. This spring may have its upper end suitably riveted at 192 to side wall 114. Spring 190 is positioned adjacent the roll dispensing position within housing 102 to project inwardly and perform two functions. Initially, with a full roll 112 such as shown in Figure 6, spring 190 applies a frictional resistance to one side end of the roll which is retained in the roll dispensing position. This function of the spring 190 acts to retard rotation of roll 112 or the roll disposed in the dispensing position so that it does not freely revolve or spin as web material, such as toilet paper, is withdrawn from dispenser 100 by the user. Leaf spring 190 applies an axial force against the upper portion of one end of the hollow roll core 116, this force being identified F_R on Figure 7.

Operation of the dispenser 100 as hereinabove described may now be explained. In Figure 4 the dispenser housing 102 is shown in its empty or unloaded condition. To load a roll 112 into dispenser 100, the cover, not shown, is opened, and a roll is dropped into

dispenser 100, with opposing spindles 120 and 121 in alignment with respective opposing guide tracks 110 and 111. If roll 112 is properly oriented and properly keyed, i.e., a roll having a spindle 120 with a groove 126 which suitably matches guide strip projection 124 in guide slot 110, the keyed groove 126 and projection strip 124 on spindle 120 and guide track 110 will mate. Thus, when roll 112 is dropped, it passes down into the dispensing position at the lower end of housing 102 with its core support spindles guidingly engaging with the track channel 111 and 110. The interface between groove 126 and guide projection strip 124 limits undesirable lateral motion of roll 112, and facilitates better lateral alignment of roll 112 with respect to guide tracks 10, as previously described. Figure 1 illustrates the relationship between the keying features of the roll 12 and dispenser 5 just prior to the insertion of roll 12. The sectional view of Figure 5 shows the initial or first roll 112 shortly after it has been loaded, but prior to the roll reaching the dispensing position.

If the roll about to be inserted is not properly keyed with the dispenser 110, regardless of the reason why keying was desired, the roll will not fit into the dispenser because guide projection strip 124 reduces the width of guide track 110 at that point and the spindle will be too large to progress downwardly in guide tracks 110 and 111. Further, if the roll about to be inserted is properly keyed but improperly oriented, the large spindle will be unable to fit into the narrow guide track, and roll is prevented from moving downwardly in guide tracks 110 and 111.

In Figure 6, roll 112 is shown after it has dropped into the dispensing position with its support spindles on the hollow core 116 resting on the saddle members 146 and 148 of channels 111 and 110, respectively. In this position, roll 112 has the material thereof exposed through the open bottom 150 of housing 102 for ready access to the user. Further in Figure 6, the properly oriented and properly keyed second or reserve roll 113 has been loaded into the housing by its spindles being inserted into the upper ends of channels 111 and 110, respectively.

But, the presence of roll 112 as it passed down into the dispensing position location has shifted lever 160 such that the upper support end 166 of such lever has been moved into channel 111 to form a stop within channel 111. The left spindle of roll 113 has come into engagement with this stop by the spindle resting on the inclined surface 176 of the upper support end 166 of lever 160.

Biasing spring 190 is compressed by the downward movement of roll 112 such that spring 190 applies frictional resistance to retard free rotation of roll 112. Likewise the downward movement of the spindles of roll 112 into engagement with saddle members 146 and 148 causes the spindle on end cap 118 to pass beneath the latch end 184 on spring biased latch 180. Accordingly, with roll sensing end 164 of lever 160 overlying the left spindle on roll 112 and the end 184 of spring biased latch 180 overlying the right spindle of roll 112, any attempt to raise the roll 112 is effectively blocked by these two elements to raise the roll 112 is effectively blocked by these two elements overlying the core support spindles on the opposite ends of roll 112.

The condition of rolls 112 and 113 as shown on Figure 6 where they are both retained in their respective dispensing and reverse roll positions will continue while utilization of web material from roll 112 is taking place by the toilet paper web being withdrawn by users. Also during the use of web material from roll 112 the control lever 160, especially under the biasing force of spring 168 will be continuously sensing the hollow roll core 116. Thus, the second roll 113 in the reserve roll position is continuously retained in this position during the sensing of hollow roll core 116.

As seen in Figure 6, the diameter of rolls 113 and 112 in relation to the length of lever 160, where such lever extends above its pivot pin 162, is such as to maintain these full rolls 113 and 112 out of contact with each other. Thus, with this particular full size roll and length of pivotally mounted lever 160, rolls 113 and 112 will be continuously maintained out of contact with each other as web material is being withdrawn from roll 112.

The sensing of the hollow core 116 of roll 112 is thus employed to continue retention of roll 113 in the reserve roll position with the two rolls out of contact with each other at least when the core of roll 112 approaches becoming empty so that in this latter stage of exhausting roll 112 there is no friction between the reserve roll 113 and roll 112. The important concept is that sensing of the intact core of roll 112 be utilized to continue retention of roll 113 in the reserve roll position and at least retain the two rolls out of contact with each other during the stage when roll 112 nears exhaustion of its web material.

When the web material is fully withdrawn and roll 112 becomes exhausted the condition shown on Figure 7 exists. At this time, the reserve roll or second roll 113 is still retained in the reserve roll position at the upper end of housing 102. However, the lower

sensing end of 164 of lever 160 as it presses axially against the upper portion of the end of hollow roll core 116 urges buckling of the core upon occurrence of exhaustion of web material from hollow core 116.

The forces acting on the readily deformable hollow core 116 may best be described by reference to Figure 7 and the reference characters displayed thereon. The full roll 112 has the spindles 121 and 120 of its core end caps 119 and 118 supporting the roll wound on hollow core 116 resting in the saddles 146 and 148, respectively. When the web material making up roll 112 becomes exhausted, the weight of core 116 and its end caps 119 and 118 is still resting on the saddles 146 and 148 as shown in Figure 7. Thus, there are reaction forces R_L and R_R acting along the lines of the arrows shown at the left and right where the spindles contact the saddles.

At the same time axial forces are being applied to the upper portion of the opposite ends of core 116 by the lower end 164 of spring biased lever 160 and the leaf spring 190 on the other side of the dispenser housing 102. These axial forces are represented by the arrows F_L and F_R on Figure 7.

These axial forces F_L and F_R applied from the left and right in and of themselves tend to buckle the core 116 downwardly by their being applied to the upper portions of the opposite core ends. This downward buckling of core 116 is further promoted by the force F_L generating a twisting moment about the contact point where the spindle 121 of end cap 119 engages with saddle member 146 resisted by the reaction force R_L. Similarly, the force F_R acting against the opposite end of the core 116 produces a twisting moment about the contact point of the spindle 120 of end cap 118 resisted by the reaction force R_R. These two twisting or turning moments applied at the opposite ends of the hollow core 116 further promote downward buckling of the readily deformable core 116. Thus, when web material is exhausted from core 116 so that such material is not present to strengthen the readily deformable core, a slight downward assisting pressure W applied manually as depicted on Figure 7 enables easy removal of core 116 from being held in saddles 146 and 148 at the dispensing position within dispenser 100.

Summarized, still referring to Figure 7, the axial forces F_L and F_R place the upper surface of core 116 under compression thereby tending to buckle it. Additionally the turning moments between F_L and R_L, and F_R and R_R at each end tend to twist the buckled core

downwards and out of the dispenser. In some cases, a minimal force W is applied to the upper surface of core 116, thereby making easy removal of the core and its end caps 119 and 118. Thereupon the hollow core 116 disengages from the track channels 111 and 110 and their saddle members 146 and 148, falling out of the bottom 150 of dispenser housing 102.

This frees lever 160, especially under the urging of leaf spring 168, to move to a position as shown in Figure 5. Such movement of the lever 160 shifts the sensing end 164 into the roll dispensing position area and likewise shifts the support end 166 of lever 160 away from the reserve roll position area thereby opening track guide channel 111 such that the spindles of roll 113 are now freed for this roll to move down into the dispensing position at the bottom of housing 102.

This condition for roll 113 is shown on Figure 8. From this figure it will be noted that the lever 160 has again been shifted by its lower sensing end 164 detecting the hollow core 116 within roll 113. This shifting of lever 160 again moves the upper support end 166 of lever 160 into a position to block track channel 111.

Thereafter, in loading a properly keyed and oriented new roll into the dispensing housing 102, by entering its outwardly projecting roll core support spindles into the opposite channels 111 and 110, this new roll can only pass down these channels to a point where one of its spindles encounters the upper support end 166 of lever 160 which is blocking the channel 111. Again this new roll will be held in reserve until such time as the roll located in the roll dispensing position resting on the saddle members 146 and 148 has been exhausted.

As seen in Figure 10, if a split core 116" roll is used and becomes exhausted, the lower sensing end 164 of lever 160 presses against the end of the intact roll core 116" urging buckling of the core sections upon the occurrence of exhaustion of web material from the intact core 116". This effects disengagement of the core sections from retention in the roll dispensing position. More specifically, it urges the core sections to progress through the broken line showing for the core section at the left on Figure 10. Thus, the force applied by the sensing end 164 not only applies a buckling force to the core end, but by reason of the contour and shaping of sensing end 164 it directs this buckling force against the core end in a direction tending to lift the core off of the saddle member 146, thereby freeing it from the friction which previously existed between the roll core support spindle and saddle

member 146 during normal use of web material from roll 112.

As the intact core undergoes the buckling action between its core sections following the exhaustion of web material from the intact roll core, the core sections disengage from the track channels 110 and 111 and their saddle members 146 and 148 falling out of the open bottom 150 of housing. This frees lever 160, especially under the urging of leaf spring 168, to move to a position as is shown in Figure 5.

This movement effectively shifts the sensing end 164 of lever 160 into the roll dispensing position area and likewise shifts the support end 166 of lever 160 away from the reserve roll position area thereby opening track guide channels such that the spindles of the roll are now freed for this roll to move down into the dispensing position at the bottom of housing 100.

It should be noted that the position of guide projection strip 124 and the existence of annular groove 126 do not adversely affect the ability of dispenser 100 to dispense sheet material from rolls, store rolls in the reserve position, or transfer rolls from the reserve position to the dispensing position.

While particular embodiments of the invention have been shown and described, it is recognized that various modifications thereof will occur to those skilled in the art. Therefore, the scope of the herein-described invention shall be limited solely by the claims appended hereto.

What is claimed is:

1. A dispenser for dispensing flexible sheet material from a roll having projecting end portions, one of the projecting end portions having an annular groove therein, said dispenser comprising: first and second opposing lateral side walls, each lateral side wall having a guide track for guiding a respective projecting end portion of the sheet material roll, said guide track of said first lateral side wall having an elongated guide projection therein, said elongated guide projection being sized and shaped to correspondingly fit within the annular groove of the one projecting end portion.

2. The dispenser of claim 1, wherein said guide tracks are generally rectangular shaped in cross-section, said guide tracks further including a plurality of internal wall surfaces, said guide projection extending from one of said internal wall surfaces of the guide track of said first lateral side wall into said guide track of said first lateral side wall.

3. The dispenser of claim 2, wherein the guide track of said first lateral side wall is smaller in width than the guide track of said second lateral side wall.

4. The dispenser of claim 3, wherein the guide track of said second lateral side wall is void of guide projections.

5. The dispenser of claim 2, wherein said plurality of internal wall surfaces include a forwardly facing wall surface, a rearwardly facing wall surface, and an inwardly facing wall surface, said guide projection located on one of said forwardly and rearwardly facing wall surfaces of the guide track of said first lateral side wall.

6. The dispenser of claim 1, wherein said guide tracks and said elongated guide projection are generally vertically oriented.

7. The dispenser of claim 1, wherein said guide projection is substantially complementary with the annular groove.

8. A dispensing system for dispensing flexible material from sheet material rolls; said system comprising:

a rolled products dispenser, said dispenser includes first and second opposing lateral side walls, each lateral side wall having a guide track, said guide track of said first lateral side wall having an elongated guide projection therein; and

at least one sheet material roll, each said sheet material roll includes a flexible sheet material wound around a hollow core having first and second ends, and roll guiding means located partially within said hollow roll core and extending outwardly from both said first and second ends of said hollow roll core for guiding the sheet material roll in the opposing guide tracks of the rolled product dispenser, said roll guiding means including a first outwardly projecting cylindrical portion extending outwardly past the first end of the hollow roll core and a second outwardly projecting cylindrical portion extending outwardly past the second end of the hollow roll core, said first outwardly projecting portion including at least one annular groove located in its circumference;

wherein when said sheet material roll is inserted into said dispenser, said guide tracks guide a respective outwardly projecting cylindrical portion of the sheet material roll with said annular groove cooperating with said elongated guide projection.

9. The dispensing system of claim 8, wherein said annular groove is U-shaped in cross section and extends completely around the first outwardly projecting portion.

10. The dispensing system of claim 8, wherein the first outwardly projecting portion is smaller in diameter than the second outwardly projecting portion.

11. The dispensing system of claim 10, wherein said guide tracks are generally rectangular shaped in cross-section, said guide tracks further including a plurality of internal wall surfaces, said guide projection extending from one of said internal wall surfaces of the guide track of said first lateral side wall into said guide track of said first lateral side wall.

12. The dispensing system of claim 11, wherein said guide tracks and said elongated guide projection are generally vertically oriented.

13. The dispensing system of claim 8, said roll guiding means further includes a first end cap positioned in the first end of the hollow roll core, and a second end cap positioned in the second end of the hollow roll core, said first end cap including an inwardly projecting portion located inside said hollow roll core and said first outwardly projecting portion, said second end cap including an inwardly projecting portion located inside said hollow roll core and said second outwardly projecting portion.

14. The dispensing system of claim 13, wherein the guide track of said second lateral side wall is void of guide projections, and the second outwardly projecting portion is void of annular grooves.

15. The dispensing system of claim 8, said first outwardly projecting portion including an end positioned distally from said first end of said hollow roll core, said at least one annular groove located between said first end of said hollow roll core and said distal end.

16. The dispensing system of claim 15, including alignment means for aligning said at least one annular groove with respect to said first end of said hollow roll core to align said at least one annular groove with said elongated guide projection when said sheet material roll is inserted into said dispenser.

17. The dispensing system of claim 16, wherein said alignment means includes a stop flange extending from said roll guiding means adjacent said first outwardly projecting portion, said stop flange cooperating with said first end of said hollow core to locate said at least one annular groove a predetermined distance from said first end of said hollow roll core.

18. The dispensing system of claim 13, wherein said inwardly projecting portion of said first end cap includes a stop flange projecting radially outward adjacent both said inwardly projection portion and said outwardly projecting portion of said first end cap, said stop flange abutting said first end of said hollow roll core when said inwardly projecting portion of said first end cap is completely inserted into said hollow core to thereby locate said at least one

annular groove a predetermined distance from said first end of said hollow roll core to align said at least one annular groove with said elongated guide projection when said sheet material roll is inserted into said dispenser.

19. The dispensing system of claim 8, wherein the first outwardly projecting portion is smaller in diameter than the second outwardly projecting portion, and the guide track of said first lateral side wall is smaller in width than the guide track of said second lateral side wall.

20. The dispensing system of claim 8, wherein said guide projection and said annular groove are substantially complementary.

21. A sheet material roll for use in a rolled product dispenser having opposing guide tracks and a guide projection in one of the guide tracks, the sheet material roll comprising:

flexible sheet material wound around a hollow core, said core having first and second ends; and

roll guiding means located partially within said hollow roll core and extending outwardly from both said first and second ends of said hollow roll core for guiding the sheet material roll in the opposing guide tracks of the rolled product dispenser, said roll guiding means including a first outwardly projecting cylindrical portion extending outwardly past the first end of the hollow roll core and a second outwardly projecting cylindrical portion extending outwardly past the second end of the hollow roll core;

said first and second outwardly projecting portions permitting the roll to be guided within the opposing guide tracks of the rolled products dispenser, said first outwardly projecting portion including at least one annular groove located in its circumference cooperating with the guide projection.

22. The sheet material roll of claim 21, said annular groove extends completely around the first outwardly projecting portion.

23. The sheet material roll of claim 21, wherein the first outwardly projecting portion is smaller in diameter than the second outwardly projecting portion.

24. The sheet material roll of claim 23, wherein the second outwardly projecting portion is void of annular grooves.

25. The sheet material roll of claim 21, said annular groove is U-shaped in cross section and extends completely around said first outwardly projecting portion.

26. The sheet material roll of claim 21, said first outwardly projecting portion including a first end located at the first end of the hollow core and a second end distally located from said first end of said hollow core, said at least one annular groove located entirely between said first and second ends of said first outwardly projecting portion.

27. The sheet material roll of claim 26, including alignment means for aligning said at least one annular groove a predetermined distance from said first end of said hollow roll core.

28. The sheet material roll of claim 27, wherein said alignment means includes a stop flange extending from said roll guiding means adjacent said first outwardly projecting portion, said stop flange cooperating with said first end of said hollow core to locate said at least one annular groove said predetermined distance from said first end of said hollow roll core.

29. The sheet material roll of claim 21, said roll guiding means further includes a first end cap positioned in the first end of the hollow roll core, and a second end cap positioned in the second end of the hollow roll core, said first end cap including an inwardly projecting portion located inside said hollow roll core and said first outwardly projecting portion, said second end cap including an inwardly projecting portion located inside said hollow roll core and said second outwardly projecting portion.

30. The sheet material roll of claim 29, said first outwardly projecting portion including an end positioned distally from said first end of said hollow roll core, said at least one annular groove located between said first end of said hollow roll core and said distal end.

31. The sheet material roll of claim 30, wherein said inwardly projecting portion of said first end cap includes a stop flange projecting radially outward adjacent both said inwardly projection portion and said outwardly projecting portion of said first end cap, said stop flange abutting said first end of said hollow roll core when said inwardly projecting portion of said first end cap is completely inserted into said hollow core to thereby locate said at least one annular groove a predetermined distance from said first end of said hollow roll core.

32. The sheet material roll of claim 30, said annular groove extends completely around the first outwardly projecting portion of said first end cap.

33. The sheet material roll of claim 30, said first outwardly projecting portion having a inner section extending from said first end of said roll to said annular groove and an outer section extending from said annular groove to an end positioned distally from said first end of said hollow roll core, said inner and outer portions having equal diameters.

34. The sheet material roll of claim 30, wherein the first outwardly projecting portion of said first end cap is smaller in diameter than the second outwardly projecting portion of the second end cap.

35. The sheet material roll of claim 34, wherein the second outwardly projecting portion on said second end cap is void of annular guiding grooves.

36. The sheet material roll of claim 30, said annular groove is U-shaped in cross section and extends completely around said first outwardly projecting portion on said first end cap.

37. The sheet material roll of claim 30, wherein said inwardly projecting portions of both said first and second end caps include a conical centering portion for locating its end cap in a respective end of said hollow roll core.

38. The sheet material roll of claim 21, wherein said annular groove is substantially complementary with the guide projection.

39. A sheet material roll for use in a rolled product dispenser having opposing guide tracks and a guide projection in one of the guide tracks, the sheet material roll comprising:

flexible sheet material wound around a hollow core, said core having first and second ends;

a first end cap positioned in the first end of said hollow roll core and extending outwardly from said first end of said hollow roll core, said first end cap including an inwardly projecting portion located inside said hollow roll core and an outwardly projecting portion for guiding the sheet material roll in a respective guide track of the rolled product dispenser, said outwardly projecting portion including at least one annular groove located in its circumference cooperating with the guide projection; and

a second end cap positioned in the second end of said hollow roll core and extending outwardly from said second end of said hollow roll core, said second end cap including an inwardly projecting portion located inside said hollow roll core and an outwardly projecting portion for guiding the roll of sheet material in a respective guide track of the rolled product dispenser.

40. The sheet material roll of claim 39, wherein the outwardly projecting portion of said second end cap is void of annular grooves.

41. The sheet material roll of claim 40, said outwardly projecting portion of said first end cap includes a first end located at the first end of the hollow core and a second end distally located from said first end of said hollow core, said at least one annular groove located entirely between said first and second ends of said outwardly projecting portion of said first end cap.

42. The sheet material roll of claim 41, wherein said inwardly projecting portion of said first end cap includes a stop flange projecting radially outward adjacent both said inwardly projection portion and said outwardly projecting portion of said first end cap, said stop flange abutting said first end of said hollow roll core when said inwardly projecting portion of said first end cap is completely inserted into said hollow core to thereby locate said at least one annular groove a predetermined distance from said first end of said hollow roll core.

43. The sheet material roll of claim 40, wherein said annular groove is substantially complementary with the guide projection.

44. The sheet material roll of claim 40, wherein the outwardly projecting portion of said first end cap is smaller in diameter than the outwardly projecting portion of the second end cap.

FIG. 1

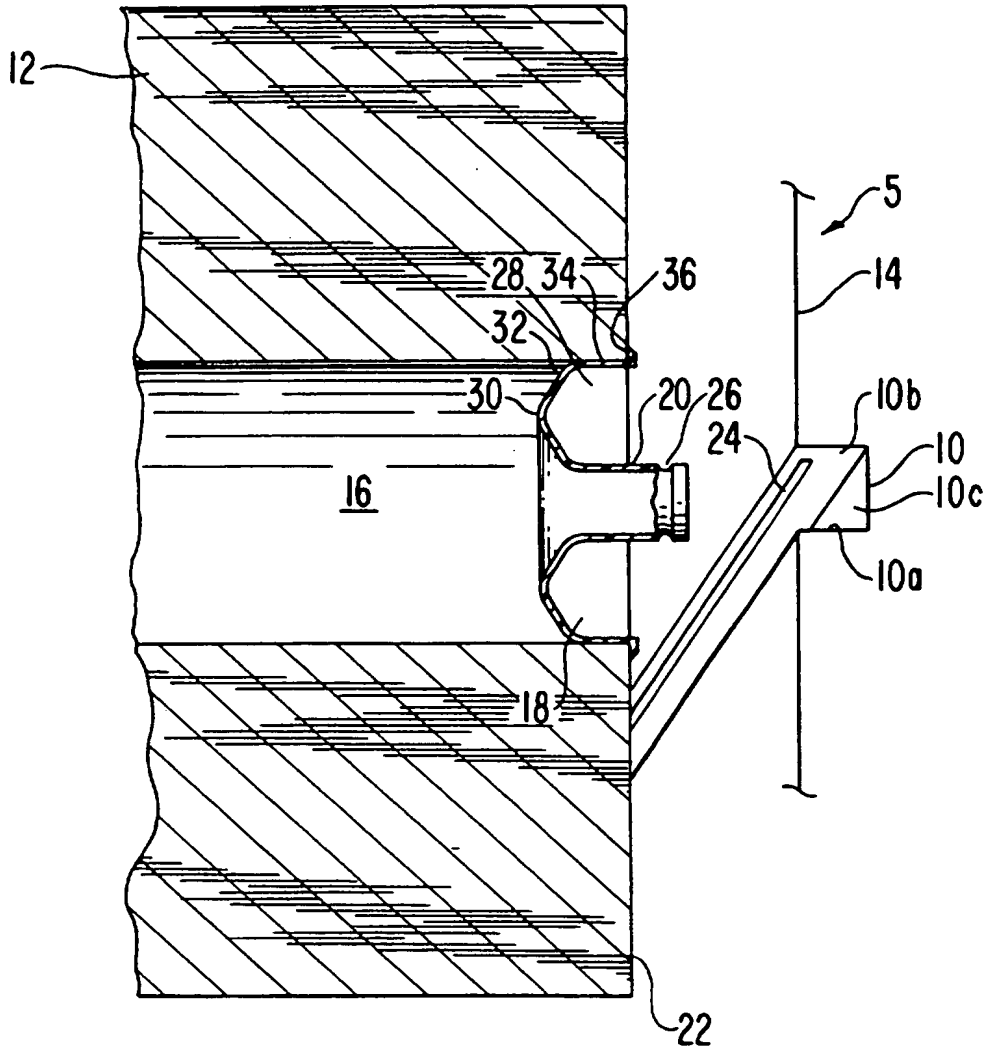
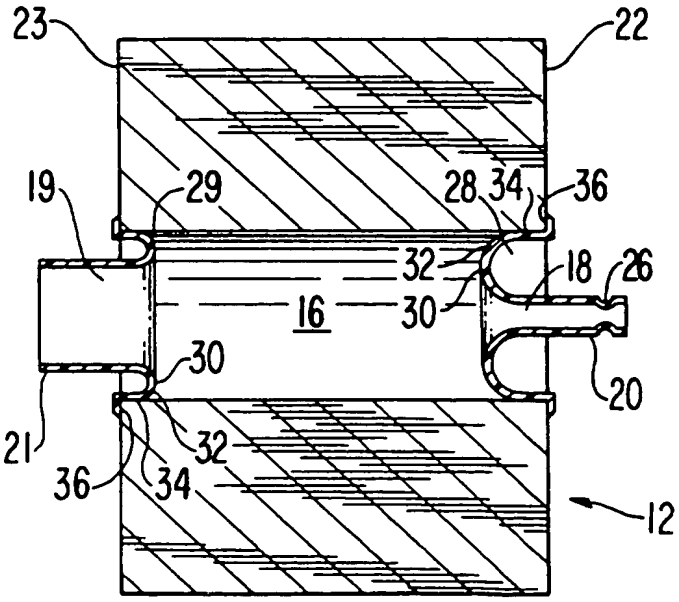


FIG. 2



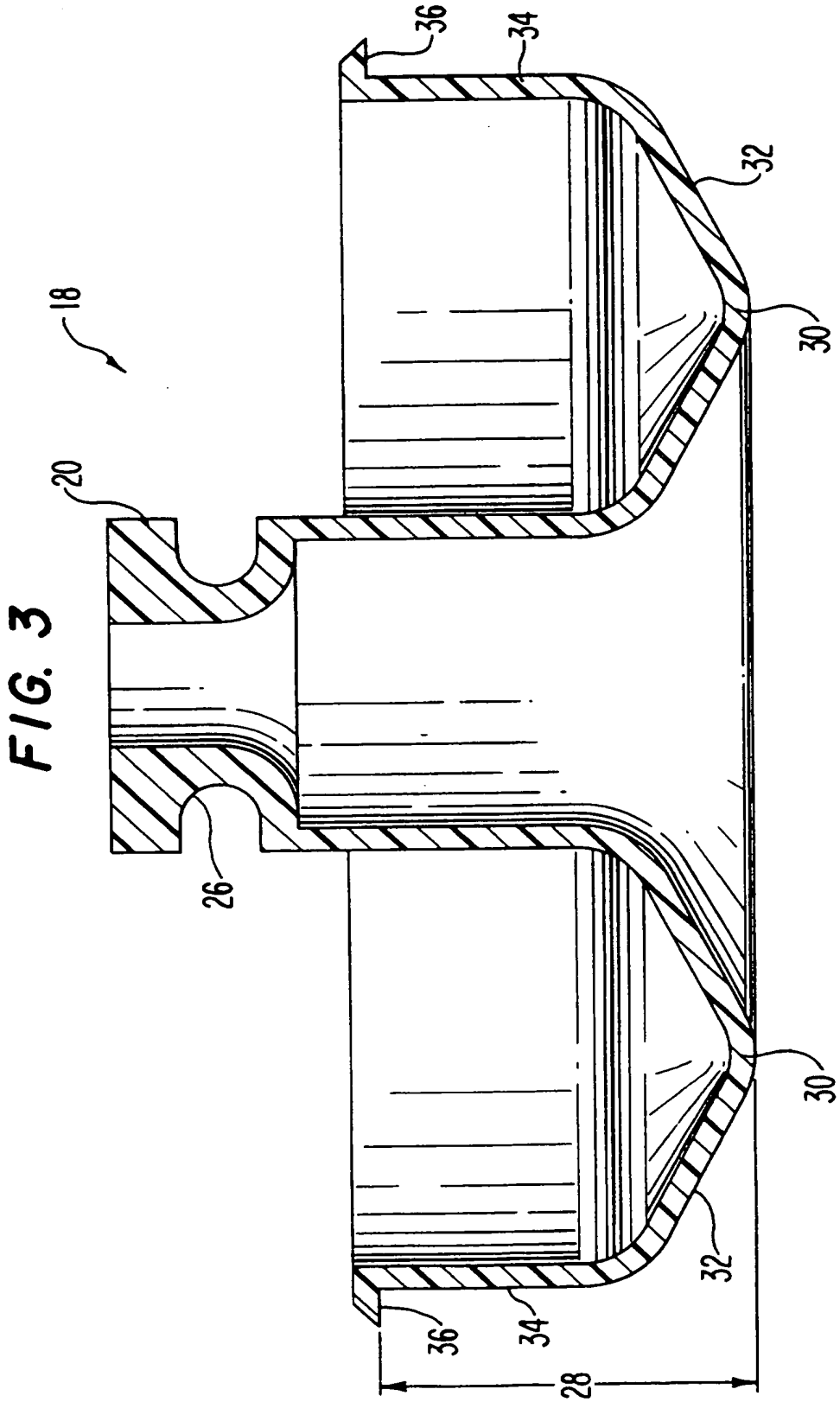


FIG. 3

FIG. 5

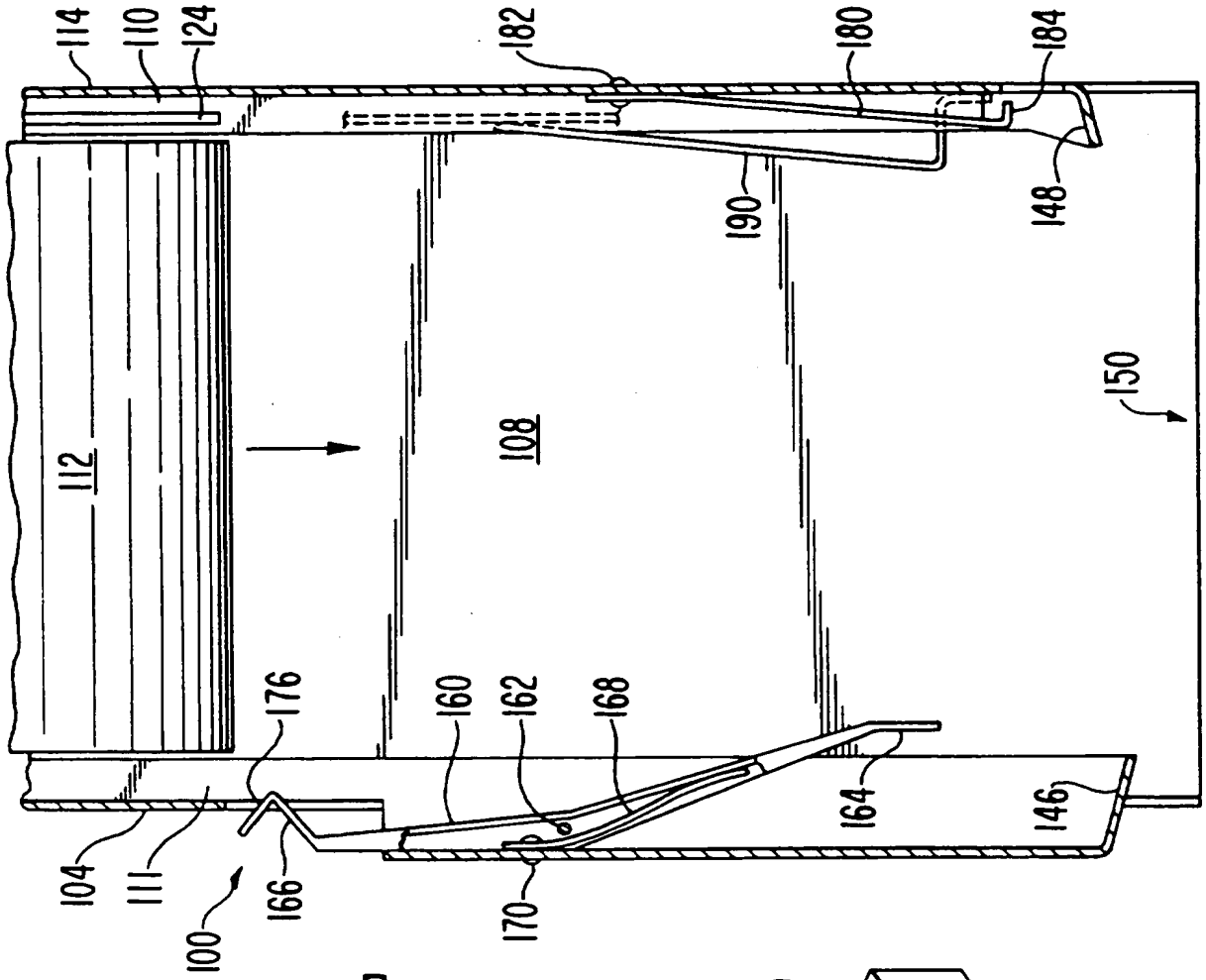


FIG. 4

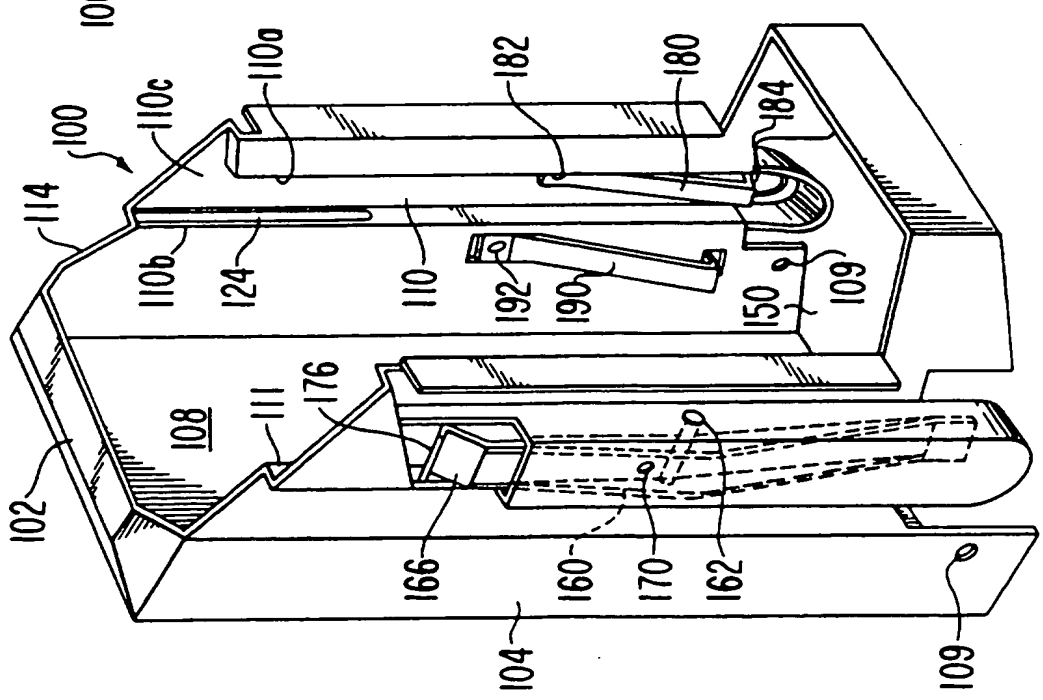


FIG. 6

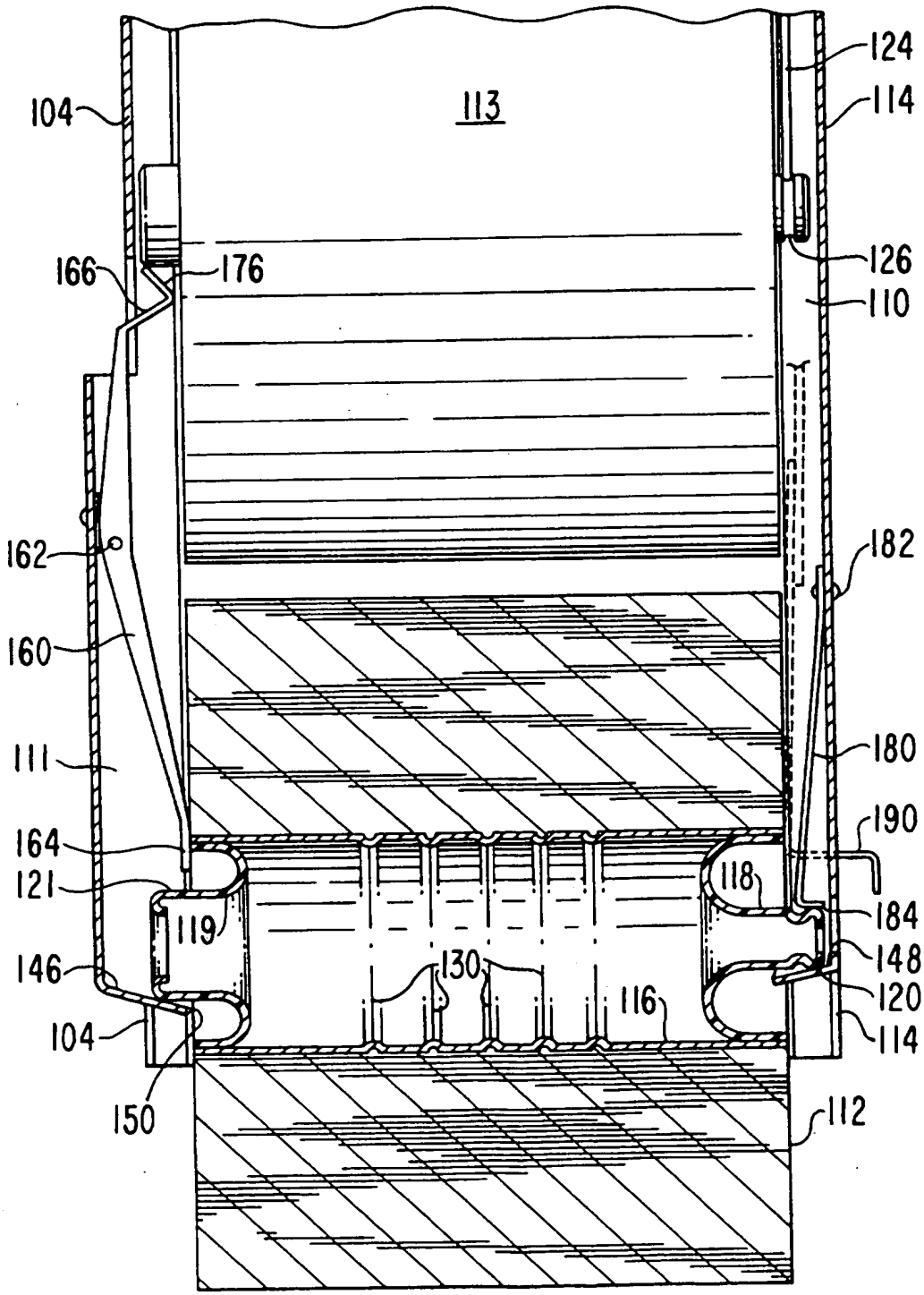


FIG. 7

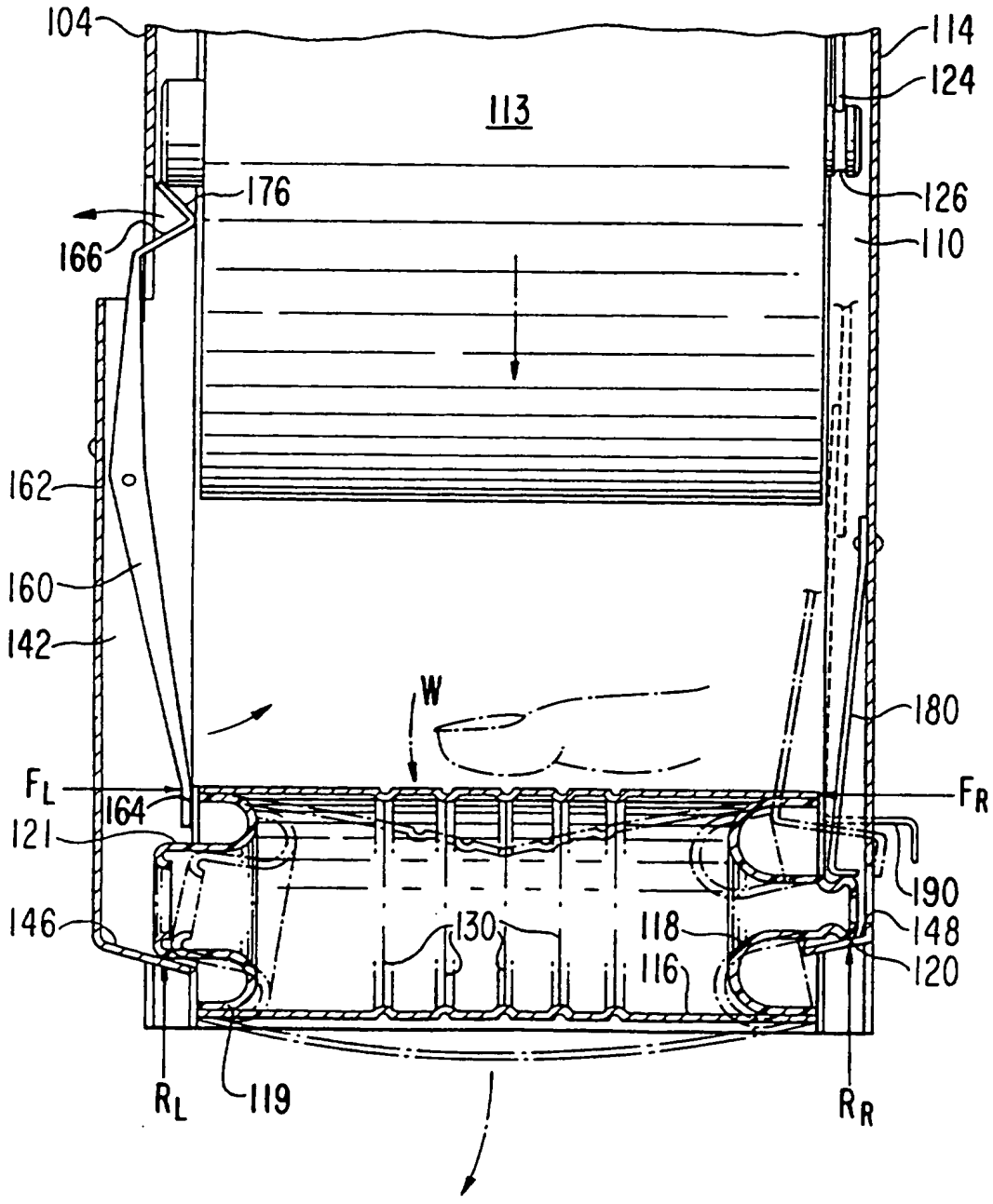


FIG. 9

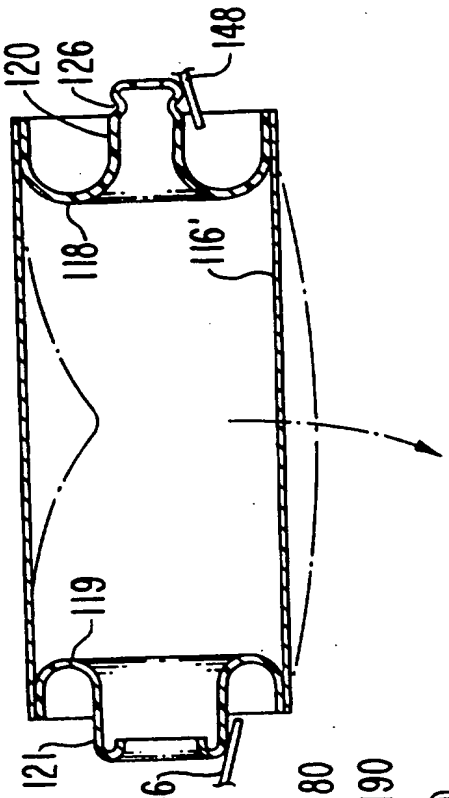


FIG. 8

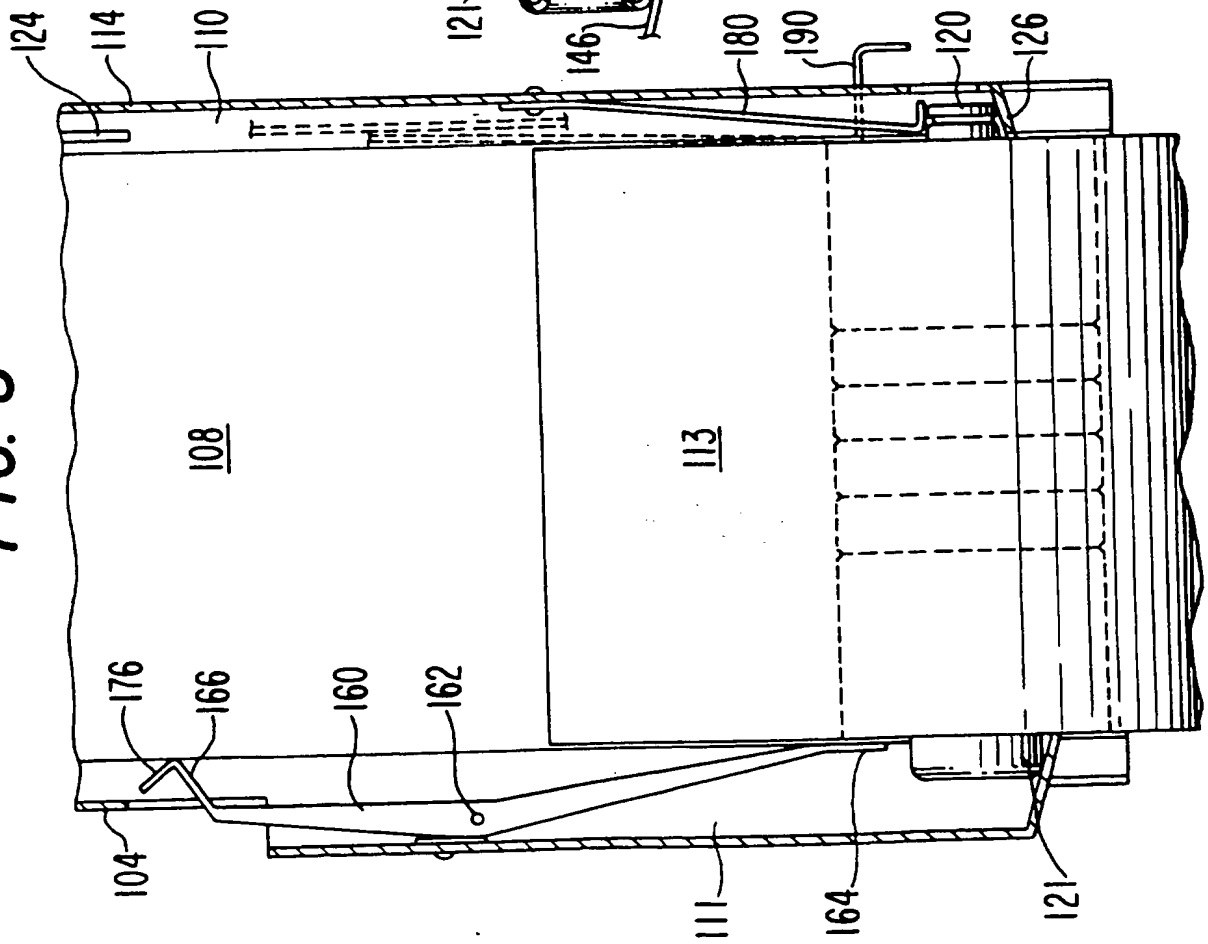
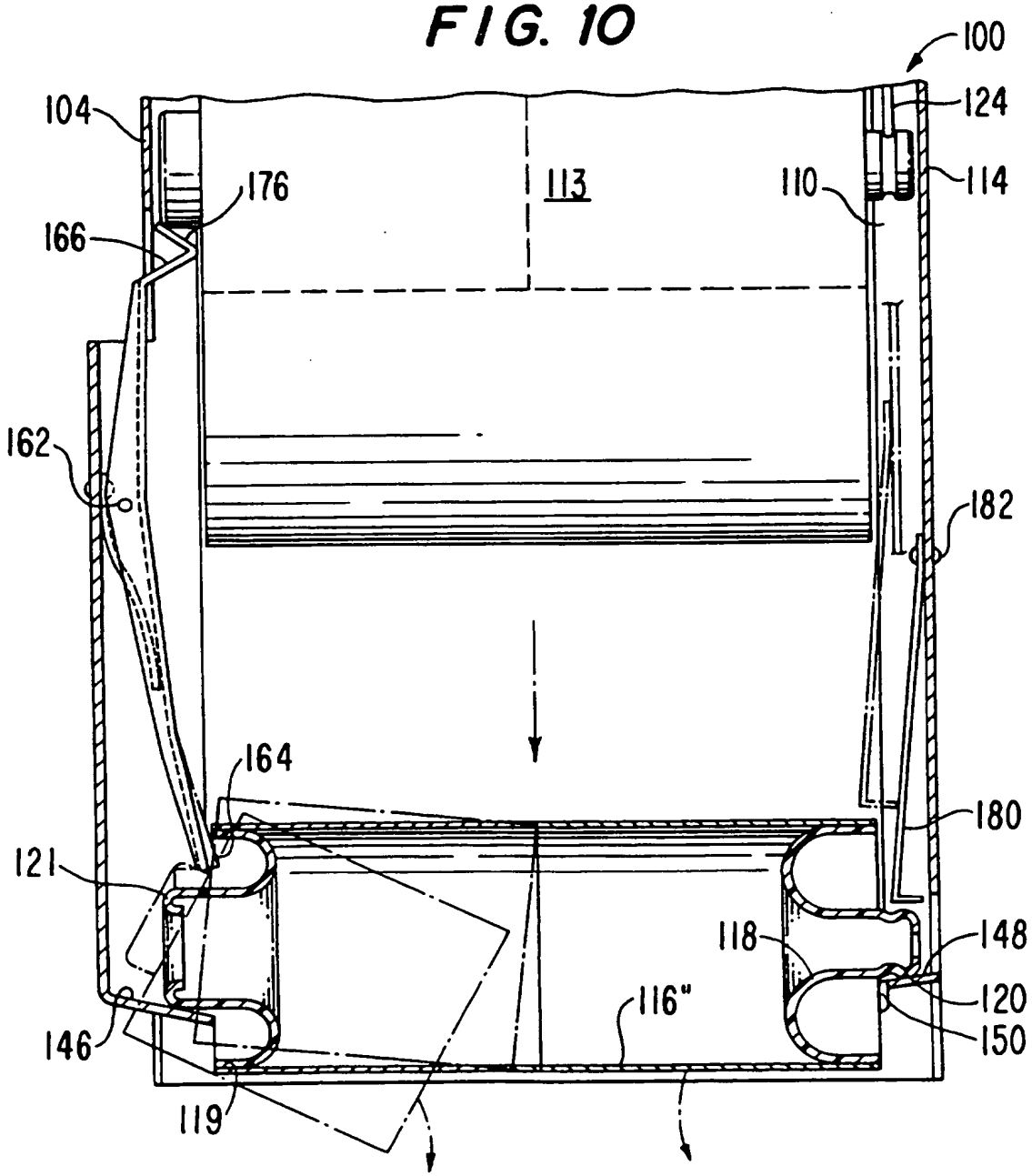


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/01167

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B65H 19/00, 16/06, 18/04
US CL :242/561,599.3,599.4
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 242/561,599.1-599.4; 312/34.8,34.22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A, 3,437,388 (JESPERSEN) 08 APRIL 1969 SEE ENTIRE DOCUMENT	2-5 AND 7-44
X ---- Y	US,A, 4,307,639 (DELUCA) 29 DECEMBER 1981 SEE ENTIRE DOCUMENT	1,6 ---------- 2-5 AND 7-44
X ----,E Y	US,A, 5,495,997 (MOODY) 05 MARCH 1996 SEE ENTIRE DOCUMENT	1-6 ------- 7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 27 MARCH 1996	Date of mailing of the international search report 06 MAY 1996
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Form PCT/ISA/210 (second sheet)(July 1992)*